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OF THE
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MORRIS ARBORETUM
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THE
MORRIS ARBORETUM
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View in the Pinetum

The illustration on the title page of this number is a view showing a part of the road running through the Pinetum toward the Swan Pond. Coming into the left side of the picture are the pendant tassels of a large Himalayan Pine *(Pinus excelsa* Wall).

Among the smaller evergreens standing at the sides of the road are specimens of Cypress *(Chamaecyparis)* the Swiss stone pine *(Pinus Cembra* L.) spruces and hemlocks, mostly of Asiatic origin.

High over all in the background is seen the spreading top of a weeping willow *(Salix babylonica* L.) rooting in the bank of East Brook near the bridge.

RODNEY H. TRUE

WINTER INJURY TO BOXWOOD AT THE MORRIS ARBORETUM

In recording the injurious effects of sub-zero temperatures on Boxwood during the winter of 1933-34, the writer had listed the unusual injurious effects on a percentage basis, discarding entirely the average winter injury, according to the known hardiness of the species. While it is of importance to record the actual damage caused by intense cold during winter, which is intensified by the warm spring sunshine and rapid thaws, it is also of importance to record the percentage of recovery which, after all, is the ultimate result, whether it becomes partial or permanent recovery or death to the specimen.

In figuring on a percentage basis, no actual measurements were made, it being done by guesswork, so that the percentage of injury is approximate. Care has been taken also in determining the killing of the entire plant, including the root system. During the following spring pruning, species that were found to be killed to the ground were cut back to the root-stock and allowed to remain in the ground until late summer. Thus, adequate time for development of growth was assured. The percentage of injury may be represented by a thinning-out of individual growths and, in severe cases, the entire vegetative growth destroyed. In most cases the shedding of the old foliage was very pronounced, especially in unclipped (natural growth) specimens, but by this shedding of leaves approximately 80% of the boxwood leaf miners were destroyed. It was also observed that when boxwood foliage was deficient in chlorophyll during the preceding summer and fall, death of the entire growth invariably resulted the following spring. While we may regard cold spells and sudden thaws as the most destructive agencies during the average winters, causing surface injuries of a temporary rather than permanent nature, it has been observed that deeper-seated injuries to internal structure, resulting from severe sub-zero temperatures, were the contributing factors in the permanent injury from which the boxwood did not recover. It would be difficult to record the hardiest species of Buxus from the accompanying list, for although a few showed no injurious effects, the same specimens might have been badly damaged under different environment.

These records do show conclusively that the Korean Boxwood—"Buxus microphylla Koreana"—which has been thought to be one of the hardiest species, is the tenderest species of them all according to those grown in the Arboretum. Different environmental conditions, high and low ground, protection from other trees and shrubs, did not affect the results. In presenting the following list of species of Buxus, together with the Arboretum records of low-temperature injuries, the size, shape and exposure of the specimen, and other general information that may prove of value, has been included to make the records as complete as possible.

Except as otherwise indicated, the plants noted below grew on a hillside with southern or southeastern exposure.

Buxus sempervirens, L.—M360

Bushy specimen, 7 ft. to 8 ft. high—10% injury to young growths partially protected by tree. Recovery slow.

Buxus sempervirens angustifolia West—M634

Natural growth, 9 ft. to 10 ft. tall. Removal of old leaves only. Good foliage developed during the summer.

Buxus sempervirens arborescens L.—M363

Natural growth 6 ft. high—No injury.

Buxus sempervirens arborescens L.—M359

Larger natural specimen 15 ft. high—No injury.

Buxus sempervirens Handsworthii K, Koch—M357

Large spreading loose-branched specimen—Uninjured.

Buxus Harlandii, Hance—M351

Natural specimen 10 ft. high. Foliage badly stripped along branches—50% injury—recovery slow.

Buxus sempervirens myrtifolia, Sweet—M1634

Clipped specimen 6 ft. high—10% injury on northwest side only.

Buxus sempervirens rotundifolia, Baill.—M355

Formal specimen—40% injury. Recovery good, especially on old wood.

Buxus sempervirens rotundifolia, Baill.—M352

Large specimen—no damage.

Buxus sempervirens rotundifolia, Baill.

Nine healthy sheared specimens 6 ft. high x 6 ft. spread growing in windswept valley, north and northwestern exposure, slight hillside; Specimens 1 and 2 on low ground—60% of branches killed—did not recover. Specimens 3, 4, 5 and 6 growing on slightly higher ground—90% injury—no recovery. Specimens 7, 8 and 9, growing on higher ground, exposed to west winds and sunshine—no injury to growth and foliage.

Buxus sempervirens suffruticosa, L.—M376

Sheared specimen 5 ft. high, 7 ft. spread, fully exposed to south and southwest—uninjured, not even leaf-burn.

Buxus sempervirens suffruticosa, L.—M377

Same as above—uninjured.

Buxus sempervirens suffruticosa, L.—M1810

Specimen 4 ft. high growing in low wet ground—95% killed—no recovery.

Buxus sempervirens rotundifolia, Baill.—M350

Large spreading semi-natural growth—10% injury. Recovery good on old stems.

Buxus sempervirens variegata, West—M372

Spreading specimen of natural growth—90% reverted to type (plain green)—no injuries.

Buxus sempervirens variegata, West

Low spreading natural growth, 4 ft. high—no injuries.

Buxus Balearica—M374

Specimen 9 ft. high, semi-natural growth. East and northeast exposed side unaffected. Southern exposed side 80% killed. Recovery very poor.

Buxus microphylla Koreana, Nakai—M362

Large spreading specimen growing on hillside—south and southeast exposure. Entire plant killed. This species is the most tender of all the boxwoods.

Buxus microphylla Koreana, Nakai—M703

In protected place in Japanese Garden—southeast exposure—80% killed. Growth protected by snow—uninjured.

Small plants 6 to 8 inches high of Buxus sempervirens suffruticosa, Buxus sempervirens Handsworthii and Buxus microphylla Koreana, planted on high ground with southwestern exposure, wintered perfectly due to a covering of snow during the extreme low-temperature period.

Buxus sempervirens suffruticosa, L.

Bushy compact plants 2 ft. high used as an edging and growing on high, flat terrace fully exposed to south, southeast and southwest winds. Plants in four long rows for the purpose of dissecting a formal rose garden.

In the plants in rows running southwest to northeast, spring leaf-burn was decidedly above normal and recovery was good. Permanent injury to growths or branches was 10%. The major part of this injury represented entire plants killed to the ground or individual branches completely killed. Leaf-burn, as usual, was more pronounced on the south and southwestern side that is subject to intense sunshine. The plants were finally removed, pruned back and planted in nursery rows for growing on, but the development of vegetative growth from these plants has been very poor.

JAMES LAMBERT.

BIRDS AT THE ARBORETUM IN LATE FALL

THE AREA constituting the Morris Arboretum includes two portions, one about ninety acres in Philadelphia County enclosed by the iron fence. This area contains two small brooks, the shore line of the Wissahickon Creek, upland and lowland, many conifers, several thickets, and a large number of trees growing singly and in groups. The other area of farm land, Bloomfield, consists of seventy acres of open rolling land in Montgomery County on the opposite side of Northwestern Avenue, and offers a quite different set of surroundings.

The lowland will be greatly improved ornithologically when shrubs, willows and a few clumps of alder are planted on the banks of the brook which takes its course through the meadow, and also when sedges and cattails grow in and alongside of the small marshy backwater of the creek.

On the higher parts an excellent opportunity for observation of birds presents itself. It will be most interesting to see how the winter species react to the berries on the exotic trees and shrubs, especially the northern forms driven south by severe weather and lack of food.

The small number of English Sparrows is rather remarkable. There is a flock of five or six, which can be found around the garage, but even these are not always in evidence. During November of this year (1935) more Yellow-bellied Sapsuckers were recorded than have ever before been seen by the writer in any one Fall. This most likely was due to a migration "wave" and was an extraordinary sight. Twenty Cedar Waxwings have been feeding on the berries borne by several trees in the group on the high ground of Hillcrest Avenue, and it is assumed that they will remain as long as the supply lasts. The Arboretum apparently has its full quota of what might be called the winter insect destroyers, such as the Downy Woodpecker, Brown Creeper, Tufted Titmouse, Blackcapped Chicadee and White-Breasted Nuthatch.

It was a distinct pleasure to find three individuals of the Red-tailed Hawk resting in and flying over this location. The undeserved and unwarranted persecution of Hawks and Owls in general, instigated by "sportsmen's" organizations and ammunition manufacturers, has greatly diminished these birds, and the really bene-

ficial ones have suffered the most. Red-tailed Hawks are decided benefactors of the agriculturist and silviculturist, but being large and noticeable, are easily shot. Two Cooper's Hawks find happy hunting grounds here, as they live on small birds and poultry. This species and the Sharp-skinned Hawk are the two worst offenders in this part of the country. They are comparatively small and being swift, and as a rule staying close to cover, are seldom seen by the average person.

The following list shows the species found and their relative abundance during November and half of December of 1935:

Eastern Green Heron—Butorides virescens virescens

An individual of this species was to be found during November by the brook which runs through the meadow.

Common Mallard—Anasplatyrhynchos platyrhynchos

Two were seen acting in such a wary manner that they must have been wild.

Cooper's Hawk—Accipiter cooperi

Two were observed, one staying close to the Avenue of Oaks and the other in the trees by the Pond.

Eastern Red-tailed Hawk—Buteo borealis borealis

Three appeared together; two were perched in the woods and the third soaring over the meadow.

Northern Red-shouldered Hawk—Buteo lineatus lineatus

One was discovered perched in the trees by the Pond.

Eastern Sparrow Hawk—Falco sparverius sparverius

Only one seen and that flying over.

Ring-necked Pheasant—Phasianus colchicus torquatus

Several can usually be flushed where upland brook joins the creek.

Eastern Mourning Dove—Zenaidura macroura carolinensis

One seen flying over.

Eastern Belted Kingfisher—Megaceryle alcyon alcyon

Can as a rule be seen or heard along the creek.

Yellow-bellied Sapsucker—Sphyrapicus varius varius

A great many passed through and were observed only in the fruit trees and by the Pond.

Eastern Hairy Woodpecker—Dryobates villosus villosus

Only one of this species seen.

Northern Downy Woodpecker—Dryobates pubescens medianus

May be seen wherever there are trees and shrubs.

Northern Blue Jay—Cyanocitta cristata cristata

Usually in evidence, but being a wanderer, is at times absent.

Eastern Crow—Corvus brachyrhynchos brachyrhynchos

Always to be found and several large flocks were seen passing over.

Black-capped Chickadee—Penthestes atricapillus atricapillus

Several are usually in the woods by the creek.

Tufted Titmouse—Baeolophus bicolor

Two or three can always be observed in the woods.

White-breasted Nuthatch—Sitta carolinensis carolinensis

Several are always in the trees along the creek.

Red-breasted Nuthatch—Sitta canadensis

Only one seen and that in the trees by the boathouse.

Brown Creeper—Certhia familiaris americana

One or two usually in evidence on any tree, whether standing alone or in a group.

Eastern Ruby-crowned Kinglet—Corthylio calendula calendula

Found several times singly in the evergreens by the house on Hillcrest Avenue, in the Japanese Garden, and in the thicket near the greenhouses.

Cedar Waxwing—Bombycilla cedrorum

A flock of twenty has been feeding on all the trees with berries, except the holly.

Starling—Sturnus vulgaris vulgaris

Not as many as expected. Several can always be found in the trees in the meadow and along the creek.

English Sparrow—Passer domesticus domesticus

Few in number and found only by the garage.

Eastern Cardinal—Richmondena cardinalis cardinalis

Two pairs appear to have divided that part of the Arboretum between the office and Hillcrest Avenue, one pair staying to the east of the Pond and the other to the west of it.

Eastern Goldfinch—Spinus tristis tristis

Several in their wanderings occasionally pass through.

Slate-colored Junco—Junco hyemalis hyemalis

Present in great numbers and can be seen anywhere except the meadow.

White-throated Sparrow—Zonotrichia albicollis

A flock can always be found in the low evergreens and bushes at the end of the Avenue of Oaks.

Eastern Fox Sparrow—Passerella iliaca iliaca

Several passed through on migration.

Eastern Song Sparrow—Melospiza melodia melodia

Occasionally seen along the creek.

LEWIS MACCUEN SMITH.

MORRIS ARBORETUM MONOGRAPHS

I.

THE FIRST Morris Arboretum Monograph was published in December, 1935. It is entitled *The Beginnings of Plant Hybridization* and is written by Conway Zirkle a member of the Arboretum Staff.

The opening chapter deals with the earliest descriptions of both plant and animal hybrids. Even in prehistoric times, cultivated varieties of plants were accidentally crossed and the valuable hybrids were unconsciously selected by the primitive agriculturists. Species crosses in animals were knowingly made and the common farm animal, the mule, existed as early as 800 B. C. Indeed the classical and medieval philosophers had a great deal to say concerning animal crosses and they described many fantastic and impossible hybrids. Eels and vipers supposedly interbred as did lions and panthers, horses and cows, camels and pigs, etc. During the sixteenth, seventeenth and even the eighteenth century it was believed that human beings often crossed with apes, bears, dogs and other animals.

During the greater part of this period grafting was a common practice and many attempts were made to cross plants in this manner. It was not until the end of the seventeenth century that the possibilities of cross pollination were recognized. The first authentic report of plant hybridization was in a letter written by Cotton Mather in 1716, but by 1761, when Koelreuter's famous work appeared, plant hybridization was well known. Surprisingly enough much of this work was done in the American Colonies, work which is described by the Monograph in detail. Twenty-nine accounts of plant hybridization before Koelreuter are reprinted in full, including several letters of John Bartram.

The Monograph sells for $2.50 but a special price of $1.88 is made to Associates of the Morris Arboretum who purchase through the Arboretum.

R. H. T.

THE DUTCH ELM DISEASE—SUMMARY OF LECTURE

BY

MR. CURTIS MAY

AT THE

MORRIS ARBORETUM—DECEMBER 14, 1935

THE SO-CALLED Dutch Elm Disease is due to a fungal parasite that lives on susceptible species of elms and in so doing causes the death of the trees. Like other

serious parasites that have wrought havoc with American plants, it is of foreign origin and came to the attention of scientists abroad only at a late date. It attracted attention in Holland in 1918, but was soon reported from Great Britain, France and other European lands, where it developed serious problems.

The Dutch pathologists of the University of Utrecht, led by Professor Johanna Westerdijk, made the first scientific study of the disease and determined its cause. When their results were made public, the disease came to be known as the Dutch Elm Disease, although not Dutch in origin.

It came to America rather promptly, probably about 1926, in elm logs having the fungus and the beetle through which it is mainly distributed. It escaped recognition for a short time, during which diseased logs were shipped to different manufacturing centers, mainly in the Middle West. When detected, the importation of the elm logs was stopped, but the disease and one of the beetles distributing it had already begun work at the ports of entry, along railroad lines leading from port to factory and in the neighborhood of cities in which the elm logs were turned into furniture.

In 1930 it was found in Cleveland and Cincinnati, and in 1933 and 1934 at Baltimore and New York and Norfolk, the points of entry.

In 1933 the disease was found in Northern New Jersey, and Federal and State agencies mobilized to study the situation in that place. In 1933 scouts were sent into the field, taking samples of the wood from suspicious trees, from which the laboratory technicians cultivated out the fungus and identified it.

The region included within a radius of fifty miles from New York proved to have the worst infection, with slight infections elsewhere. This area continued to be the main center of trouble.

Two arms of the Federal service, both in the Department of Agriculture, are working on this problem. The scouting work is done by men from the Bureau of Entomology and Quarantines. The technical laboratory studies are carried out by the Division of Forest Pathology of the Bureau of Plant Industry with headquarters at Morristown, N. J. The work thus far done indicates that the fungus lives in the sap wood of the trees, in which it does its damage and in which it fruits. It seems clear that it enters the tree through the borings of one or more bark beetles *(Scolytus)* that bear the spores of the fungus *(Ceratostomella)* either on their appendages and bodies or internally.

It seems that the disease is carried over in weak elm trees, from which healthy ones are attacked. Hence, the importance of cleaning out the weak trees as a sanitation measure. Fortunately, the disease seems not to spread as rapidly as the chestnut blight.

The present measures being taken against this menace are:

1. Scouting to determine the location of diseased trees.

2. The removal of these, with treatment of the stumps and wood to kill the organism.

3. The sanitation work, involving the removal of weak trees in swamps and similar places in which the disease might persist.

The scout watches all of our native elms for wilted leaves, that may be green if the branch is recently attacked, yellow in later stages. He looks for brown streaks in the outer sap wood when the bark is removed; in sections of infected branches a brown ring is seen in the outer sap wood. Since there are other elm diseases of a less serious character, with which the Dutch Elm Disease may be confused, the cultivation of the *Ceratostomella* on proper culture media in the laboratory with the appearance of its characteristic fruiting bodies is needed to give a certain identification.

Since the fungus lives saprophytically in dead elm wood, the problem of dead infected trees becomes important. Wood piles of elm wood, stumps and decaying trunks may prove to be important sources of trouble.

The disease is known in Virginia (Norfolk), Indiana and in New York, extending into New Jersey and Connecticut. It has not yet been found in Pennsylvania. The results from the work thus far done indicate that if complete eradication cannot be accomplished, control of the disease may be practicable.

Persons having elms that offer suspicious symptoms may have specimens examined at the Laboratories in Morristown, New Jersey. Several pieces of wood from smaller branches from ½" to 1" in diameter and 6 inches long, showing brown discolorations of the sap wood, offer favorable material for investigation. Since the disease is spread through the weak trees that act as host for the young beetles, tree owners should try to keep their elms in good condition, but should avoid over-fertilization. Infected trees should be removed as completely as possible, since the disease germ sometimes passes from tree to tree through root grafts made in the ground.

As to susceptibility, no species of American elms are believed to be immune or resistant. Some of the Asiatic kinds are more so.

Since no remedy for the disease is known, and since the danger of spread is very real, trees with this disease should be cut down and the wood burned to destroy the parasites.

Reported by RODNEY H. TRUE.

ABSTRACT OF

DR. LYLE W. R. JACKSON'S LECTURE ON DISEASES OF THE PLANE TREE

AT THE

MORRIS ARBORETUM—JANUARY 11, 1936

DR. JACKSON pointed out that the plane trees used so extensively in city planting about Philadelphia are probably hybrid trees of foreign origin, known widely as the London plane. Our related native sycamore or buttonwood tree belongs to another species *(Platanus occidentalis)*.

He stated that until rather recently the chief disease of planes occurring in this region is an anthrachnose, due to a fungus belonging to the genus *Gloeosporium*. This kills the leaves, and perhaps young twigs in the spring, giving the trees the appearance for a time of having been scorched. This disease is not immediately serious, but when repeated year after year, may cause important damage or even death.

About two years ago, a serious new disease was found in Upper Darby, Brookline, Beechwood, Ardmore and Drexel Hill, where it was taking a heavy toll of the plane trees. After a study, carried on by Dr. Jackson as opportunity has permitted, it seems clear that a fungus belonging to the genus *Ceratostomella* is responsible for the damage. Sparseness of the foliage, which assumes a yellowish color, is a symptom that grows with the progress of the disease, appearing usually two or three years before the death of the tree. Trunk lesions are seen as discolored areas of the bark, where infection has entered through frost cracks, damage from the hub of vehicles or other wounds. The surface of the wood under the damaged bark is blackened, the color appearing in fine, perpendicular lines that penetrate deeply into the wood along the sheets of cells known as the medullary rays. These rays seem to be the path along which the fungus invades the deeper tissues. Under the microscope these cells are seen to be occupied by the threadlike mycelium or body of the parasite, and in these tissues the spores, or reproductive bodies, are formed in countless numbers. These are able when freed to spread the disease to other trees having wounds that provide paths of entry such as wounds from pruning, wind damage, etc.

No lesions have been found by Dr. Jackson so far on buried roots, but surface roots that have been injured by wheels, or otherwise, show them.

Thousands of plane trees have died and have been removed from the streets of the Philadelphia suburbs named. No survey has yet been made to show how widespread the disease really is at this time. Although it is reported from Camden, it seems to be still a local trouble. A search of the literature by Dr. Jackson has not shown its presence elsewhere, nor indeed does the disease seem to have received scientific study before the work here reported.

How it got to this region, and where it came from, are unanswered questions. It seems likely that the disease began to work at Beachwood about six years ago. Its introduction may have taken place from six to eight or more years ago.

It was reported by Mr. S. N. Baxter, City Arboriculturist of Philadelphia, in the discussion following the lecture, that this type of plane tree was introduced into Philadelphia about thirty years ago by Mr. William Warner Harper, of the Andorra Nurseries.

From the information thus far reported, it seems probable that another destructive fungus disease has made its appearance in our neighborhood. It is virulent, it kills promptly, and our street trees and the native sycamores of the country offer abundant means of propagation. One asks with much concern whether another group of our trees is in serious danger. The past experience with the chestnut blight and the present struggle with the Dutch elm disease suggest that this study should be actively prosecuted in order that the existing situation may be known and protective measures undertaken to stamp out this disease while it has a limited distribution.

The work reported here was done by Dr. Jackson, Dr. Sleeth and associates in the Laboratory of the Allegheny Forest Experiment Station, conducted at the University of Pennsylvania, in co-operation with the Department of Botany.

Reported by RODNEY H. TRUE.

ARBORETUM NEWS

Mr. John C. Swartley, of the Arboretum Staff, enjoyed the facilities of the Herbarium at the Arnold Arboretum in October for a study of certain unnamed types of shrubbery found at the Morris Arboretum. In December he spent several days at the New York Botanical Garden working in the Herbarium there.

The courtesies extended by these institutions are greatly appreciated.

The Koster Nursery Company, of Bridgeton, New Jersey, has generously presented about 100 specimens of Taxus to the Arboretum.

The Arboretum has been enriched from time to time by the gift of rare hemlocks from the collection of Mr. Charles Francis Jenkins, at "Far Country." His bulletin is a welcome addition to the files of the Library.

WINTER LECTURE COURSE

February 8, 1936 **DR. HARLAN H. YORK**

Diseases of the Himalayan Pine and Other Ornamental Conifers.

Professor York is the head of the laboratory of Forest Pathology, University of Pennsylvania, and Pathologist to the Arboretum.

March 14, 1936 **MR. HENRY TEUSCHER**

Winter Injury and Hardiness.

Mr. Teuscher is Dendrologist at the New York Botanical Garden.

April 11, 1936 **DR. WILLIAM CROCKER**

Injury Caused by Illuminating Gas.

Dr. Crocker is Director of the Boyce Thompson Institute for Plant Research at Yonkers, New York.

These lectures will present the results of much specialized scientific research and will apply these results to practical problems.

Lectures come on the second Saturday of each month.